

## Environmental Science Course Overview:

<b>Unit outlines:</b>	<b>Big Ideas:</b>
Unit 1: Background (Nature of Science) Unit 2: Ecosystem and Community Ecology (Biosphere I) Unit 3: Natural Resource Distribution (Geosphere) Unit 4: Natural Resource Use (Anthroposphere I) Unit 5: Climate (Hydrosphere & Atmosphere) Unit 6: Pollution (Anthroposphere II) Unit 7: Populations (Biosphere II) Unit 8: Energy & Society (Anthroposphere III)	<ol style="list-style-type: none"> <li>1. Science is a process</li> <li>2. Earth is one interconnected system made of matter &amp; energy</li> <li>3. Energy conversions underlie all ecological processes</li> <li>4. Humans alter natural systems</li> <li>5. Environmental problems have a cultural &amp; social context</li> <li>6. Human survival is a function of sustainable practices</li> </ol>

### What's the Big Idea?

#### 1. Science is a process

- a. Nature of science
  - i. Paradigm shifts
  - ii. No "answer key"
- b. How do we know what we know?
  - i. Experimentation & Scientific method
  - ii. Computational / graphing / analytic skills

#### 2. Earth is one interconnected system made of matter & energy

- a. Geosphere
  - i. Natural resource distribution (Unit 2)
- b. Atmosphere/Hydrosphere:
  - i. Climate (Unit 4)
- c. Biosphere
  - i. Ecosystem & Community Ecology (Unit 1)
  - ii. Population (Unit 6)
- d. Anthroposphere
  - i. Natural resource use (Unit 3)
  - ii. Pollution (Unit 5)
  - iii. Environment & Society (Unit 7)

#### 3. Energy conversions underlie all ecological processes

- a. matter and energy that interacts in predictable ways
- b. energy
- c. conservation of mass
- d. thermodynamics (conservation on energy, entropy)
- e. efficiency

#### 4. Humans alter natural systems

- a. Anthropocene

#### 5. Environmental problems have a cultural & social context

- a. Energy & society
  - i. addiction to fossil fuels
- b. Environmental laws

#### 6. Human survival = f(sustainable practices)

- a. Capstone debate:
  - i. Climate solutions: trade-offs, economics, ethics, calculations, local & national

# Unit 1 Overview: Nature of Science

## Background

Science is a process: How do we know what we know? (Nature of science, historical perspectives)

### SUBTOPICS:

1. There are patterns that can be described as RULES; they are the same everywhere in the universe
  2. Graphs and tables are useful tools to communicate and interpret data
  3. Graphs show the relationship between two real quantities and can be used deceptively
  4. Science is a systematic study of the universe that we use to understand its many mysteries; scientific method allows study of small parts of the universe within a larger context
  5. Valid scientific experiments help us collect data and formulate theories
  6. Scientists conduct investigations for many reasons: discover new aspects of the natural world, explain recently observed phenomena, test the conclusions of prior investigations, or test the predictions of current theories/paradigm.
- New techniques and tools → new evidence to guide inquiry and new methods to gather & manipulate data → advance science.
    - a. Quality of exploration =  $f(\text{accuracy \& precision of data}) = f(\text{technology used})$
    - b. No “answer key” (Inquiry Cubes)
    - c. paradigm shifts (4-sided figure puzzle)
  - Mathematical tools/models improve our questions, experiments, explanations, and communication.
    - Scientific knowledge is represented by models and data
  - Science is dynamic: new knowledge & methods emerge through inquiry & public communication (argument, logical debate) among scientists that build connections between natural phenomena, investigations, and the historical body of scientific knowledge.
    - Weight of evidence
    - The information learned in this class was found over time in this way
  - Scientists must clearly report their methods and procedures through conferences in peer-reviewed publications. Other scientists can verify the results by repeating experiments.
  - Math & study skills review

### ACTIVITIES

- Inquiry tubes, cubes & puzzles
- The Lorax by Dr. Suess
- Tragedy of the Commons simulation
- Socratic Seminar: *Lifeboat Ethics*
- Exploring large scales: [Nanoreisen](#) & cards
- Unit conversions / factor label method / dimensional analysis (w/ scientific notation review)
- [Energy Primer](#) (from the College Board website)
- Transition: Experimental design, SOIL LAB →

### VOCABULARY

- Steps of the scientific method {hypothesis, independent & dependent variables, controls, etc.
- Weight of evidence
- Paradigm
- “Commons” (with examples)

### MATH SKILLS

- Convert units as necessary to solve word problems; convert units of the metric system
- Multiply, divide, add and subtract numbers in scientific notation
- Have a basic intuition (“gut feeling”) with the relative size of metric measurements

### ABBREVIATIONS

- Metric prefixes:
  - nano- ( $10^{-9}$ ), micro- ( $10^{-6}$ ), milli- ( $10^{-3}$ ), centi- ( $10^{-2}$ ), deci- ( $10^{-1}$ ),
  - deka ( $10^1$ ), hecto- ( $10^2$ ), kilo- ( $10^3$ ), mega- ( $10^6$ ), giga- ( $10^9$ )
- APES: Advanced Placement Environmental Science
- FRQ: Free-response question (the essay portion of the AP test)